CONTROL PHASE

DMAIC Methodology

Define

- ***IDENTIFY OPPORTUNITY***

Tollgate Review

Measure

- ***DESCRIBE AS-IS CONDITION***

Tollgate Review

Analyze

- ***IDENTIFY KEY CAUSES***

Tollgate Review

Improve

- ***PROPOSE & IMPLEMENT SOLUTIONS***

Validate & Replicate Changes

Tollgate Review

Control

- ***SUSTAIN THE GAIN***

Tollgate Review

Learning Objectives: Control Phase

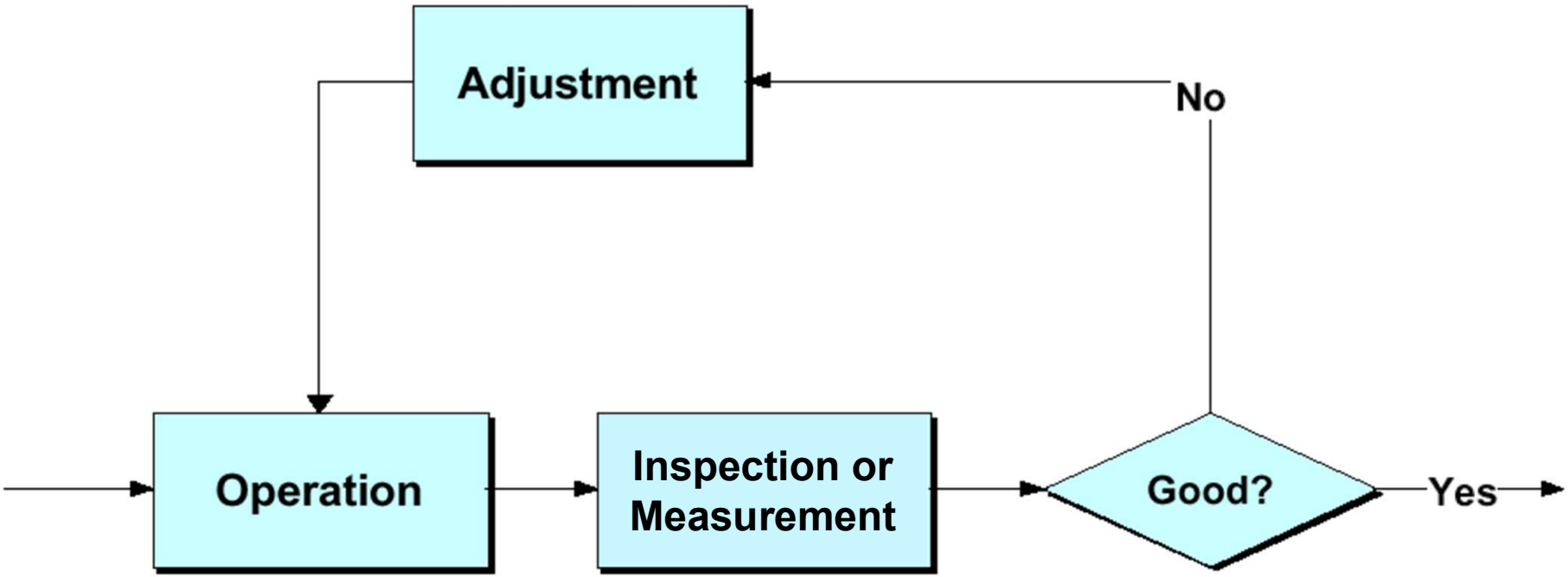
- Understand the tools necessary to complete the Control Phase.
- Develop a Control Plan to monitor and sustain implemented improvements.
- Properly document and follow-up on completed projects and events.
- Categorize and communicate project benefits.
- Explain Design for Six Sigma for new processes.

Control Plan

Control System Contents

- Control Systems contain:
  - Critical inputs.
  - **Desired outputs / performance levels.**
  - Capture and report of **actual** process performance measures.
  - A feedback mechanism to report deviations in actual outputs from desired levels.
  - Adjustments to the process.
- Can be reinforcing (amplify the deviation) or balancing (bring back to equilibrium) - balancing is normally what gets implemented.

A Basic Control System



Control Lag = Time between Operation and when any applied adjustment takes effect.

What Is a Control Plan?

- Control Plans provide a written summary description of the systems used in minimizing variation in the improved process.
- Control Plans do not replace information contained in detailed instructions (SOPs).
- The Control Plan describes the actions that are required at each phase of the process to assure that all process outputs will be in a state of control.

Control Plans Answer the Following Questions

1. What is the process that is being controlled?
2. What are the process outputs that are being monitored / controlled?
3. What are the inputs that are being monitored / controlled in order to keep the output at its target level?
4. How are the inputs and outputs being measured, monitored, and controlled?
5. How does someone react when the inputs or outputs are not in control?

Process Control Plan – Example

- No standard template, completely customizable to fit the organization's needs.
- Ultimately, the Control Plan is a living document reflecting current methods of control and measurement systems used.

Control Plan No.:	Key Contacts/Phone	Date (Orig.)	Date (Rev.)	Effective:
Service No./Latest Chg. Level	Core Team		Customer Eng'g. Approval/Date	
Part Name/Description	Supplier Approval/Date		Customer Quality Approval/Date	
Supplier / Supplier Code	Other Approval/Date		Other Approval/Date	

Service/ Process Number	Process Name/ Operation Desc.	Equip.	Characteristics			Special Class.	Methods					Reaction Plan
			No.	Service	Process		Service/Process Spec/Tolerance	Evaluation Measurement Technique	Sample Size	Sample Freq.	Control Method	

Control Plan Tips

- Establish controls to detect defects.
- Use illustrations.
- Use flow diagrams.
- Use work instructions that really work.
- Use reaction plans that really work.
- Focus on the **quality** of documentation, not the quantity.
- Use workers to help write the instruction.
- Clearly lay out authorities, roles, and responsibilities.

"I have made this letter longer than usual, only because I have not had time to make it shorter." – Blaise Pascal

Control Plan Tips (Cont.)

- Focus on the identification of nonconforming services.
- Ensure segregation by identification or location to prevent inadvertent use.
- Address the need for recall or previously provided service.
- Ensure the benefit of rework versus loss.
- Ensure that rework actually produces first quality service.
- Ensure that corrective actions are initiated whenever nonconforming services are provided.

Include the Cause and Effect Diagram to help build the Control Plan, using it as a reference.

Control Plans Summary

- Control Plans can be likened to sustainment in 5S.
- SPC is not successful without religious use of Control Plans.
- Control Plans are living documents. If processes change and a new variation cause develops, add it to the Control Plan.

Exercise: Control Plan

Break into Simulation groups and create a Control Plan for your Statapult process.

Process/ Equipment	Input / Output	Measurement Technique	Specification/ Tolerance	Sample (Size/Freq.)	Reaction Plan
Statapult Process	Lead Time	Time (Supply to Delivery)	275 secs. +/- 25 secs.	Every order	Halt production, investigate

Instructions: Draw the template above on your Flip Chart Paper

- Identify 3 measurements (CTXs) that should be controlled
- Complete all the columns
- Use markers and write BIG

15 minutes

Knowledge Check: Control Plan

What questions does a good control plan address?

Project Closeout / Sustainment

Bringing the Event to Completion

1. Ensure that:

- All feasible process improvement ideas have been implemented.
- The project sponsor / process owner and personnel from the affected work area have been adequately trained on the process changes.
- Event objectives have been met or exceeded (Validate).
- Processes are updated.
- Needed controls are instituted in the process.

2. Quantify event benefits Return on Investment (ROI)

3 Week RIE Follow-Up Checklist

RIE TEAM will use this Check List to ensure RIE gains are sustained

RIE FOLLOW UP ACTIVITIES

By: _____ **Date:** _____ **% Complete:** _____

Team: _____

First Week After RIE. % Complete:	Second Week After RIE % Complete:	Third Week After RIE. % Complete:
☐ 1. Ensure RIE documents are published on the appropriate knowledge sharing site.	☐ 1. Review open action items	☐ 1. Review open action items
☐ 2. Assist VSC w/ completion of Cost Reduction Report	☐ 2. Audit new process; Ensure standard sequences are being followed; Collect, review, and evaluate process performance measures (**As identified in RIE TPR**)	☐ 2. Audit new process; Ensure standard sequences are being followed; Collect, review, and evaluate process performance measures (**As identified in RIE TPR**)
☐ 3. Team Leader is responsible for the following: Notify VSC when final RIE Report Package is available Ensure Report shows the freed capacity Work with VSC in recommending FTEs redeployment Develop a 30 & 60 day action item list Develop a Plan to audit process every 30 days Update standard work to indicate touch & flow times, and VA, NVA, NVA(E) steps Collect Process Performance Measures (**As identified in RIE TPR**) Send Thank you email to all participants	☐ 3. Present performance results to VSC and Team (Via updated TPR) ☐ 4. Team Lead and Black Belt address process issues. ☐ 5. Brief Leadership on RIE Follow Up Progress (Using the status of this Check list)	☐ 3. Present performance results to VSC and Team (Via updated TPR) ☐ 4. Team Lead and Black Belt address process issues. ☐ 5. Brief Leadership on Progress. (Using the status of this Check list)
☐ 4. Ensure all workers are trained on new process		
☐ 5. Post Standard Work Documents in Work Space		
☐ 6. Address parking lot issues by assigning action items		
☐ 8. Schedule RIE outbrief to Leadership Team		
☐ ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.	☐ ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.	☐ ** Team Leaders (TL) assign action items to specific people on the teams and require follow up reports on progress.

Kaizen/RIE Follow-Up Beyond the Event

Green Belt

- Ensure standard work is implemented.
- Foster success – market results.
- Complete and submit documentation on event.
- Handoff to Event Sponsor at completion of event week.

Kaizen/RIE Follow-Up Beyond the Event

Event Sponsor / Process Owner

- Monitor (Control Charts, Control Plans, Gemba).
- Visit the area frequently for several weeks after the Improvement Event.
- Address stakeholder issues and concerns.
- Recognize participants of event and celebrate success.
- Is Takt Time being achieved?
- Keep up the pressure completing outstanding action items.

Out Brief Tips

Final Tollgate Review - clearly captures the results of the event.

Should include:

- Charter information
- Tools utilized
- Improvements made
- Evidence of data driven decision making
- Current / Future State process flows and metrics
- ROI calculations
- Other improvement opportunities
- CPI Project Tollgate Template
  - https://www.quantico.marines.mil/Offices-Staff/G-7-Performance-and-External-Affairs/

Create a package that sums up everything.

What's a Quad Sheet ?

- Prepared for each Kaizen / RIE by the Project Sponsor with the assistance of the Green Belt.
- Started at beginning of the Kaizen / RIE.
- A key document in the formal submittal of the event's results.
- Documents key Kaizen / RIE information, metrics, status & financial results as an executive summary on one page.
- A living document that is periodically updated during and after the event as results are validated.

Quad Sheet - Template

Project / Event Title

Background	Results
Goals	Timeline / Benefits

Customize to fit your needs.

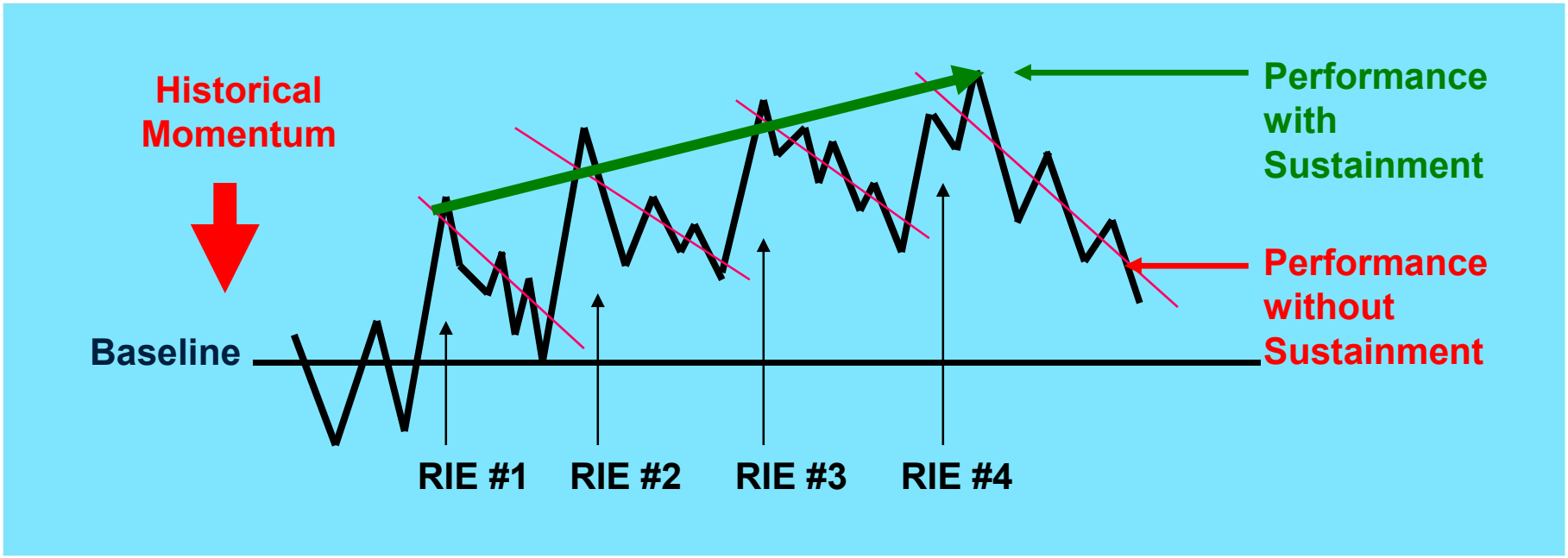
Lessons Learned

- Every improvement effort offers a lesson.
- It is what we do with these lessons that matters.
- For successful projects, we want to document our efforts and conclusions to repeat the success.
- If not successful, we want to document what went wrong to prevent repeating the same mistakes.
- The availability of this type of information can greatly accelerate future efforts.

Definition of Sustainment

Consistently adhere to process improvements, ensuring all benefits are fully realized.

- The old way is gone, the new way is the way.
- Human nature resists change and reverts to old habits.



Kaizen / RIE Follow-Up Beyond the Event

Redeployment

Redeployment

- The movement of people from a process that has been improved either through attrition, reassigning them to another CPI event or to other critical work.
- Ultimately, the key objective of a CPI Thinking organization is to reduce the amount of human effort required per unit of output, in other words increase productivity and capacity.

When to use redeployment

- To make up for current attrition.
- Eliminate or reduce overtime.
- Reduce contractor support.
- Reduce work backlog.

Replication Opportunities

Identify key lessons learned and data from this project that may be useful in other areas of the business, or for other projects:

- Data about upstream process (input) measures.
- Data on problem areas outside your team's scope,
- but important to the business.
- Reduction of waste and non-value added activities.
- Better utilization of resources.
- Benchmarking information.
- Customer requirements.

Benefits


DEFINE
MEASURE
ANALYZE
IMPROVE
CONTROL
CONTINUOUS
PROCESS
IMPROVEMENT

Review: Triple Constraints of Projects

- Project Management Constraints
  - Quality (Better)
    - Clear and Specific
  - Time (Faster)
    - Amount of Time to complete process tasks.
  - Cost (Cheaper)
    - Money and Effort

- Prioritizing Constraints
  - Should be based on the view of the customer.

Benefit Categories

Goal: Reduce Costs

- Metric: *Type I Benefits* – Cost Reductions to Budget Line Items.
- Example: Same work done with fewer resources.

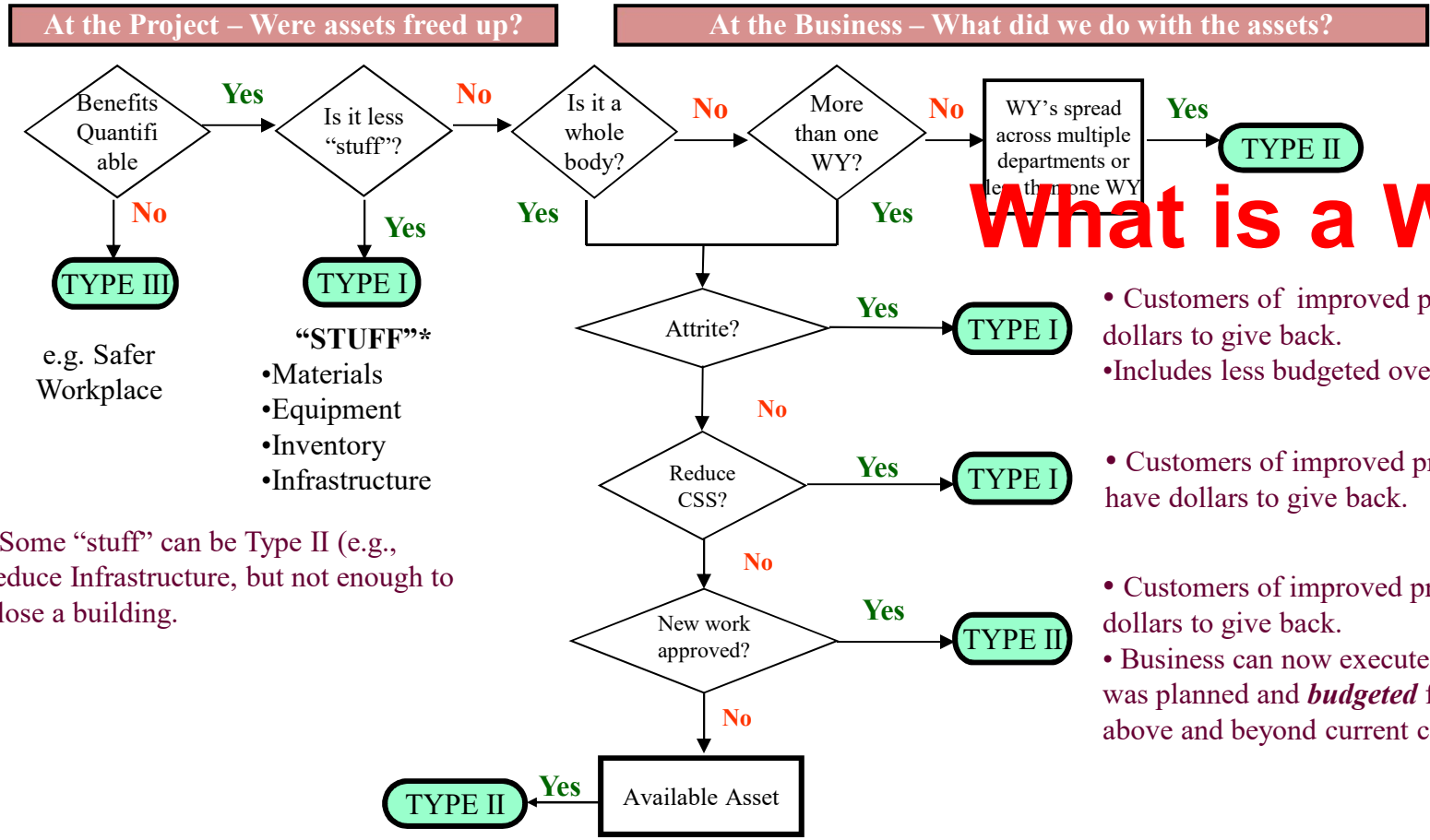
Goal: Increase Speed (Reduce Time)

- Metric: *Type II Benefits* – Process Time Reduction / Improved Resource Utilization.
- Example: More done with same resources.

Goal: Improve Safety and Quality of Life

- Metric: *Type III Non-Financial / Other Benefits.*
- Example: Risks to assets or personnel reduced.
- Customer satisfaction.

Benefit Categories Flow Chart



e.g. Safer Workplace

"STUFF"*
- Materials
- Equipment
- Inventory
- Infrastructure

*Some "stuff" can be Type II (e.g., reduce Infrastructure, but not enough to close a building.

What is a WY?

- Customers of improved process have dollars to give back.
- Includes less budgeted overtime.

- Customers of improved process have dollars to give back.

- Customers of improved process have dollars to give back.
- Business can now execute new work that was planned and ***budgeted*** for but was above and beyond current capacity.

Don't get hung up on calculating benefits!

Design for Six Sigma

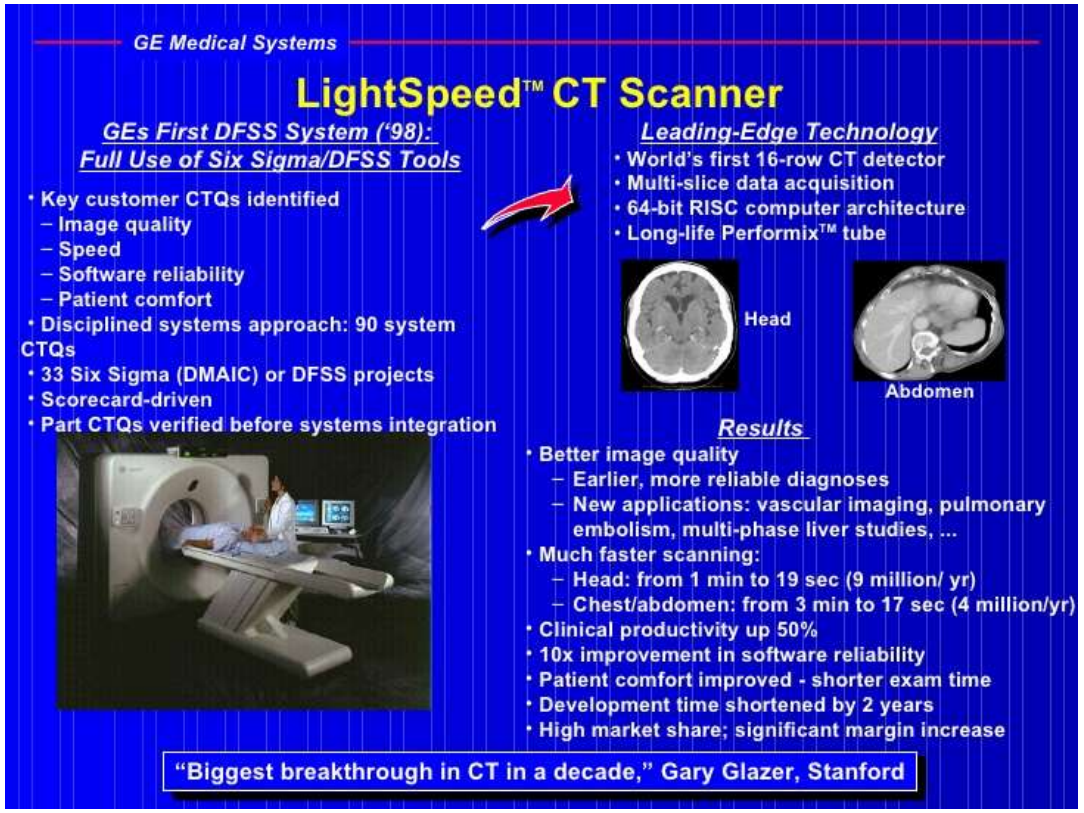
Design/Re-Design Approaches

Design For Six Sigma (DFSS) methods would be the method of choice when:

- There is no current process to fulfill customer requirements (need a brand new process).
- The process is incapable of producing quality products / services (better to start from scratch than to fix the process).

Design For Six Sigma (DFSS)

- DMADV: Define > Measure > Analyze > Design > Verify.
  - Example: DFSS was use to develop the CT Scanner.



DMADV Defined

D	*Define* the goals of the design activity. What is being designed? Why? Use QFD or the Analytic Hierarchical Process to assure the goals are consistent with customer demands and enterprise strategy.
M	*Measure* customer input to determine what is critical to quality from the customer's perspective. Translate customer requirements into project goals.
A	*Analyze* innovative concepts for products and services to create value for the customer. Determine performance of similar best-in-class designs.
D	*Design* the new product, service or process. Use predictive models, simulation, prototypes, pilot runs, etc. to validate the design concept's effectiveness in meeting goals.
V	*Verify* the design's effectiveness in the real world.

What We Have Covered: Control Phase

Control Phase Tools

- Control Plans.
- Project documentation and out-briefs.
- Project Benefits.
- DFSS/DMADV.

Training Closeout

Continuous Process Improvement

- Continuous Process Improvement (CPI) = Incremental Improvement.
- CPI is a proven method for improving processes, products, and logistics and has now proven useful across the full spectrum of operational, administrative, support, and R&D functions.
- Process Improvement will always be present in successful organizations regardless of the label associated with it.
- Greenbelts are on the frontlines of CPI.

Lean Six Sigma Summary

Lean is about flow.

- ✓ Increase process flow by eliminating waste.
- ✓ Waste is anything – effort, costs, or work that adds no value in the eyes of the customer.

Six Sigma is about quality and variation.

- ✓ Reducing defects by eliminating variation.
- ✓ Reducing differences in similar or identical processes.

Expectations of Green Belt

Understand and be able to apply the basic concepts of Lean Thinking and Six Sigma.

Have the ability to lead a team through a Kaizen / RIE Event.

Continuous Improvement for Your Career in CPI

First step – finishing GB training.

Next steps

- Get involved in a CPI event next week!
- Pursue Green Belt Certification (Lead a RIE/Project).
- Pursue Black Belt Training and Certification.

"A certificate does not make you certified. Attitude, performance, commitment to self and team — these and a certificate make you certified." - Anonymous

Green Belt Certification Requirements

- Lead a Project / Event or significant support of Black Belt Project
- Project/Event requirements:
  - Black Belt Mentor (G-7 approved)
    - Approves project/event
    - Mentors Green Belt during project/event
    - Provides P&I with recommendation for certification
  - Demonstrated use of Lean Six Sigma Tools
    - Must be a benefit to the Marine Corps
    - Belt determines tools based on project/event
    - Required tools - all projects/events

Green Belt Mentoring Requirements

Mentors provide the following services:

- ✓Review and provide guidance on project charters prior to signing.
- ✓Provide event/project coaching and assistance with meetings (as needed).
- ✓Provide project assistance (tool identification and utilization).
- ✓Review and provide guidance for tollgate and final out briefs prior to presentation.

Mentor Support Availability

CPI mentoring is based on the following:

- Command needs always have priority.
- Availability – First come, first serve.
- On a “demand pull” basis; you must arrange it.
- Attend scheduled periodic meetings as arranged.
- Mentors are to enable the project teams; teams still must be prepared to work.

Out Brief Format

Final Out Brief sections should include:

- Required Items

- Define Phase
  - Charter, SIPOC, Communication Plan, POA&M, etc.
- Measure Phase
  - Summary of Data Collected, Current State Map, etc.
- Analyze Phase
  - Root Cause Analysis (Fishbone), Statistical Analysis, SPC, etc.
- Improve Phase
  - List of Improvements, Statistical Analysis (of Improvements) Future State Map, 5S, Mistake Proofing, etc.
- Control Phase
  - Control Plan, Standard Work, Replication, Transition Plan, etc.

Make Final Out Brief Visual. Use Pictures.

Green Belt Resources

- Green Belt Course Training Material
- Templates
  - G-7 External Site https://www.quantico.marines.mil/Offices-Staff/G-7-Performance-and-External-Affairs/
  - Useful templates uploaded as requested.

What We Have Covered: Course Goals

Understand Lean Six Sigma (LSS) / Continuous Process Improvement (CPI) tools and how to apply them to your workplace.

Understand the impacts of the Triple Constraints on processes.

Facilitate small Projects or Events to attack and solve current day problems.

Assist Black Belts on Command-wide Projects and Events.

Additional Training Information

Military Students

- The below training event codes (Table 77) replaced the Military Service School codes from (Table 02).
  - LX 3 LEAN SIX SIGMA - BLACK BELT
  - LE 3 LEAN SIX SIGMA - EXECUTIVE BELT
  - LG 3 LEAN SIX SIGMA - GREEN BELT
  - LY 3 LEAN SIX SIGMA - YELLOW BELT